MINNESOTA GEOLOGICAL SURVEY

GEOLOGIC ATLAS OF HUBBARD COUNTY, MINNESOTA
COUNTY ATLAS SERIES C-41
University of Minnesota
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PART A
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Plate 1, Data-Base Map
Plate 2, Bedrock Geology
Plate 3, Surficial Geology
Plate 4, Quaternary Stratigraphy
Plate 5, Sand Distribution Model
Plate 6, Bedrock Topography, Depth to Bedrock

Scale 1:100,000

Part B, Hydrogeology, to be published separately by the Minnesota Department of Natural Resources, Division of Waters

This ArcGis 10 project (c41cgaHubbard10_4.mxd) is designed to approximate the look of the plates recently published as the Geologic Atlas of Hubbard County, Minnesota, while at the same time providing access to the digital images and data tables that support the final product. Using the project file (mxd) requires that ArcGis 10.4 is installed on your computer. The project described below was created with version 10.4 of ArcGis, earlier versions will not open the project file (.mxd), although any version will load the shapefiles. It also includes references to materials viewable with the Spatial Analyst and 3d Analyst extensions, however much of the project data is accessible without those if the license is not available. Additional data grids and shapefiles that were used in the compilation (such as till surfaces) are also provided but may not be included in the project file.

An additional project (c41cgaHubbard10_4.pmf), for the free software from ESRI called ArcReader, is also provided. The ArcReader program is available directly from ESRI.com, is free, and allows people without an ESRI license to view this and other data in a GIS context. Also an older version of the project (c41cgaHubbard10_3 is also provided for continuity with one previous version of ArcMap.

The online data may also be provided as a map package (mpk) file that is a compressed file containing all of information and the mxd in one place. It unpacks to the local computer automatically when the mpk file is opened. Data online can be accessed from the link: http://hdl.handle.net/11299/198898

In the mxd, the ArcGis window is divided into: (1) a Table of Contents window containing a list of data frames, (2) a data view window to the right of the TOC, and (3) the menus and tools that are available elsewhere on the window. Data frames contain layers (themes) that are made visible by

clicking in left side check box (legends are shown by clicking the box with the plus sign to expand the item). In order for data layers to become visible a data frame must be made the **ACTIVE** data frame. This is done by right clicking on the name of a frame and choosing **Activate** near the bottom of the menu list.

The project was created for ArcGis using a data frame size about 10.5 inches wide and 7.5 inches high and a screen resolution of 1280x1024 or higher depending upon the style of screen. All of the data frames should have a scale set initially at 1:400,000 except for the Intro frame which has an opening scale of 1:9,000,000. These settings do not remain fixed within the project, but will vary depending on what window size and scale or screen resolution was part of the last opened project, however if reset to the above specifications by the user, the pages should look as intended, without overlapping text, or an incomplete view. However as screen type and resolution or window size may change, you may need to experiment to find the best look. Additionally, a Homeview Bookmark has been added for each frame which, when selected, will return the
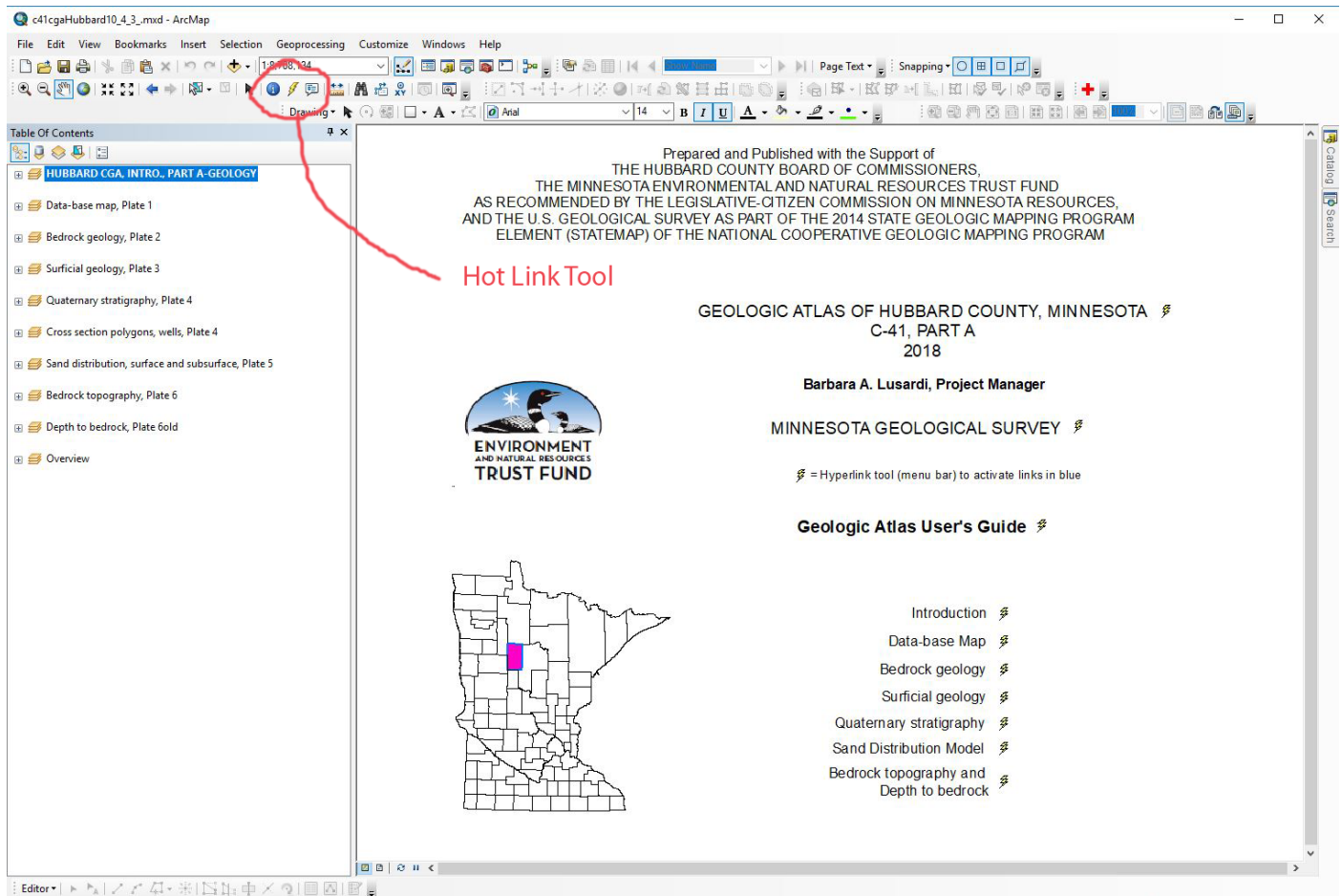
project to the initial view.

Links have been added to this project to provide additional available information such as graphics or text not in ArcGis format. These links are part of several themes on the various frame windows. The links are outlined in blue and contain a lightning bolt symbol (hot link tool). To use the link, select the lightning bolt symbol from the tools toolbar and click in the blue

box. A viewer will activate and bring up an image in the default viewer of the compute operating system (usually a pdf), independent of the ArcGis project. If the selected theme has no links, the hot link tool will be grayed-out.

After viewing the first page and trying the links to the pdf files, activate another data frame, turn the layers visible and browse. Each theme has an associated data table that holds additional data. On an active frame, the Identify Button (i symbol inside a dot) on the tools toolbar, will open a window and display table information for any individual feature that is clicked. Data in the tables can be queried, selected, viewed, exported, etc., independently from the project. Some tables (such as the water well data) may have additional data linked to them that will show up in the Identify dialog box next to a plus [+] with the name.

Under the Bookmark Menu in ArcGis each frame has a HomeView link that returns the data window to its (nearly) original scale and location. The view and scale will depend upon the actual size of the data window. If it is too different from what the original was, then the graphic elements will not be in the correct locations relative to the other features and may become too large or too small.

An index of the folders and ArcGis shape files is provided on the following pages.

Directory of folders and files provided with the Hubbard County CGA DVD:

At the Root level:

    c41cgaHubbard10_4.mxd--the ArcGis 10 project file

    c41cgaHubbard10_4.pmf--ArcReader 10.4 project file. ArcReader 10.4 must be downloaded and installed prior to use of the pmf. Check the ESRI.com web site for the free download and help information.

    c41_dvd--this folder contains all other folders and files and a copy of the ArcGis project file--c41cgaHubbard10_4.mxd.

    c41_dvd.zip--A WinZip file that should be used to place a copy of the c41_dvd files on a local drive. Directly copying of the c41_dvd file from the cd will result in a read-only copy on the local drive and permissions will have to be reset for all folder and files. **Unzipping** to a new location will create a normal read/write set of files. Make sure that the unzipped folder is named c41_dvd and is at the root level of the drive.

    A file called DoubleClicktoRunDVD; this is an exe file that will start the DVD interface if the autorun is disabled on the computer. The image files at this level are part of the DVD run features. These are also found within the c41_Hubbard_autorun folder which should be copied to the same root level as the c41_dvd folder when copying to a local computer.

Sub-Folders within c41_dvd, in alphabetical order:

figures--folder containing pdf images of plate text, figures and tables from the published plates of the atlas. The text, figures and tables are hyper-linked from the appropriate data frame (blue boxes or lines on map) in the ArcGis project. Includes an Illustrator version of the Plate 4 cross sections (cross_sections_plate4.ai). Also includes the Atlas Users Guide in pdf format.

hubb_orthophoto--2013 aerial photo of the Hubbard County area, USDA, FSA

introhtm--folder with html files linked from the opening window of the DVD that explain what is on the DVD and how to navigate it.

large_pdfs--folder containing PDF files of the bedrock topography, depth to bedrock and sand distribution figures on Plates 5 and 6 at scales of 1:100,000 with full base information displayed for location purposes.

legends--folder containing ArcGis legend (lyr) files. Can be loaded from the legend editor window and applied to a legend, to color and name items shown in the views.

metadata--folder containing the data about the major features of the maps. Metadata can also be found under the Description Tab in ArcCatalog. This may be at the gdb level, or may be attached to the main set of polgons within the gdb.

    att_ln.doc-MGS attributes for lines

    att_pol.doc-MGS attributes for polygons

    att_pts.doc-MGS attributes for points

    bedrodk_geol_metadata.pdf

    bedrock_topo_depthtobdrk_metadata.pdf

    Quaternary_stratigraphy_metadata.pdf

    sand_model_metadata.pdf

    surficial_geol_metadata.pdf

    CWIwells_db_shp.pdf

  Thumbnails--small images referenced with theArcCatalog description

plate_pdfs--pdf images of each of the six plates that make up the atlas.

    plate1_db--data-base

    plate2_bg--bedrock geology

    plate3_sg--surficial geology

    plate4_qs--Quaternary stratigraphy

    plate5_snd_dsn--sand distribution models

    plate6_bt_dt--bedrock topography, depth to bedrock

spatial--ESRI gdb, raster and shapefile data for Hubbard County maps and sand distribution models.

Note that the till surfaces are provided with the data, (finalgrids.gdb) but are not included within the ArcGis project file. They can be added if desired. Depth to the top of the tills was not determined; it was only

established for sand bodies.

Geodatabase files;

Bedrock_geology.gdb--geodatabase containing the digital files used to create the Hubbard County bedrock geology map.

bdrk_ww—point file of water wells reaching bedrock

bedrock_geo_annotation—text annotation for the bedrock map
bg_contacts_faults—line file of geologic contacts and faults
bg_polygons_tbl—polygon file of geologic units with attribute table
cretaceous_pg_tbl—polygon file of Cretaceous units with attribute table
dike—line file showing location and type of dikes
grav_model_profl—line file showing locations of geophysical models. Models and geophysical metadata in the folder 'geophysics' within the supplemental digital and GIS zip.
nimrod_pg_tbl—polygon file showing location of the Nimrod outlier of the Animike Basin
trend_lns—line file showing locations of lineations derived from the magnetic anomaly map

Bedrock_topography.gdb--geodatabase containing the digital files use to create the Hubbard County bedrock topography and depth to bedrock maps.

bedrock_topo_text—annotation file for bedrock topography

btgd-- bedrock topography raster

btln—bedrock topography contour lines (50ft. interval), blev field contains the elevation data

btpg—bedrock topography polygons (50ft. interval), blev field contains the elevation data

Depth_to_br_text—annotation file for depth to bedrock

dtgd—depth to bedrock raster

dtln—depth to bedrock contour lines (50ft. interval), contour field contains the depth data

dtpg—depth to bedrock polygons (50ft. interval), map colored by gridcode field, elevation added in symboloby tab under Properties of the file.

pc_btgd—Precambrian bedrock topography raster

pc_btln—Precambrian bedrock topography contours (50ft. interval), blev field contains the elevation data

pc_btpg—Precambrian bedrock topography polygons (50ft. interval), map colored by gridcode field, elevation added in symboloby tab under

Properties of the file.

pc_difference_pg—polygon file showing where the bedrock surface and the Precambrian bedrock surface differ,primarily to Cretaceous sediments.

DataBase.gdb

bhg_locations--drill holes with borehole geophysical logs

core_locations--drill holes with core

cuttings_locations--drill holes with cuttings (washed and cataloged samples collected during drilling)

explboring_locations--exploration drillholes

grav_locations--gravity station measurement locations

mn_counties--Minnesota county outlines and file with hot links to the pdf plate and this file

obswell_location-observation drill holes

passive_locations--measurement sites where passive seismic data was collected to determine depth to bedrock

qdi_locations--Quaternary data points

seismic_ref_locations-measurement sites of active seismic refraction data

si_dh_locations--drill holes for scientific investigation

strapt_locations--CWI wells with stratigraphic data

surf_contr_30m--30 m interval land surface contours

Textr_locations--Quaternary data locations with texture data

ww_loctions_wl--CWI water well locations, table contains water level measurements in the attribute table

final_grids.gdb--geodatabase containing raster files for all of the subsurface sand and till surfaces. Each has a top, base and thickness. The ones with eroded in the name represent working surfaces used in raster calculations but are not part of the final product. Unit descriptions can be found on Plates 3, 4 and 5.

Hubbard.gdb--geodatabase containing the base materials such as rivers, roads, lakes, township-range polys and county outline. Source is Minnesota Department of Natural Resources, Division of Waters.

Quaternary_stratigraphy.gdb--geodatabase containing the digital files use to create the Hubbard County figures showing glacial stratigraphy

xsec_plate-feature data set containing the files making up the published sections on Plate 4.

qstrat_annotation—links to digital files on Plate 4

br- 09,21,31,47,54,68—bedrock contact points for each cross

section shown on Plate 4

dike-09,21,31,47,54,68—bedrock dike locations along cross sections on Plate 4

elev_label—point file to provide elevation range of cross sections

elev_lines—line file to provide elevation indicators on cross sections

fault-09,21,31,47,54,68—point file showing bedrock faults along cross sections on Plate 4

graphic pointers-09,21,31,47,54,68—lines showing general locations of surface features

graphic_txt-09,21,31,47,54,68—Text labels, surface features

lixpy-09,21,31,47,54,68—water well polygons along cross sections, Plate 4

xsec-09,21,31,47,54,68—polygons showing Quaternary stratigraphy, cross sections, Plate 4

unitlist--file listing the sand and till units from the surface to the bedrock in decending stratigraphic order. See Figure 1 on Plate 5 for how these relate to surrounding counties.

Sand_distribution_model.gdb--geodatabase containing some of the digital files use to create the Hubbard County sand model. The majority of the rasters are in the final_grids.gdb

Sand_Distribution_Model--annotations

stacked_sands--polygone file showing the number of sand bodies that overlap between the land surface and the bedrock surface. Derived from the areal extent for each sand in the surface and subsurface. Some areas of the county may have no sands mapped in the subsurface. This does not mean that there are no sands in those locations, but based on existing data, the likelyhood is reduced.

Sand and till unit names are described on Plate 4, Plate 5, and Plate 3.

ss_thick_cont--surface sands thickness contours

surface_snds_map--distribution of surface sands from Plate 3.

The sand distribution model.gdb contains the stacked sand as polygons and the thickess of the sand units (thck_xxx), and the surface sand polygons and thickness. All of the gridded (raster) surfaces data including is in the Finalgrids.gdb and includes: _base for the bottom of units, _depth for depth below the land surface, _eroded for the working surface created when processing the sequence of rasters, _thck for the unit thickness, and _top for the top surface of each unit. The unitlist in the Quaternary_stratigraphy_pl4.gdb provides the correct top to bottom stratigraphic order.

Sg_geomorphic_lineshmbols.gdb--geodatabase containing the geomorphic line symbols showing the distribution and type of geomorphic features mapped on the landscape

Strat_lines_all.gdb--geodatabase containing all of the stratigraphic lines used to construct the rasters for the sand modeling process.

strat_all--all of the stratigraphic lines for each cross section. Best displayed via Data Driven Pages or a defination query based on et_id.

unitlist--list of units in stratigraphic order, top down.

Surficial_geology.gdb--geodatabase containing the digital files use to create the Hubbard County surficial geology map

al_alluvium_polygons—polygon file showing extent of Holocene alluvial material

e_eolian_polygons—polygon file showing extent of Holocene and Late Pleistocene wind-blown material

hl_lk_sed_polygons—polygon file showing extent of Holocene lake sediment

hummocky_area_polygons-polygon file showing extent of mapped hummocky ground

peat_polygons—polygon file showing extent of Holocene peat

regional_dem—regional surface elevation raster, colored by elevation, feet.

regional_demhs—regional surface elevation hillshade map, 315° az, 30° sun elev., 5 vx.

sg_polygons-surficial geology map

surficial_glg_annotation—annotation file for map links

topo_bnd_7_5min—polygon file with the 24,000 scale topographic map boundaries.

usgs_scanned_topo_024k_drg_C—24k topo map from USGS.

xsln_pub—line file showing location of cross sections on Plate 4. Digital file has hot links.

xsln-line file showing locations of all cross sections used to create the sand distribution model in Hubbard County.